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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/809,421	03/26/2004	Jin Ki Kim	PAT 980-2	7842
26123 7590 07/24/2008 BORDEN LADNER GERVAIS LLP Anne Kinsman WORLD EXCHANGE PLAZA 100 QUEEN STREET SUITE 1100 OTTAWA, ON K1P 1J9 CANADA				
EXAMINER HUR, JUNG H				
ART UNIT PAPER NUMBER 2824				
NOTIFICATION DATE DELIVERY MODE 07/24/2008 ELECTRONIC				

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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### Office Action Summary

**Application No.**

10/809,421

**Applicant(s)**

KIM, JIN KI

**Examiner**

J. H. Hur

**Art Unit**

2824

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 April 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 29-32, 34, 38 and 48-59 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 29-32, 34, 38 and 48-59 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Amendment*

1. Acknowledgment is made of applicant's Amendment, filed 28 April 2008. The changes and remarks disclosed therein have been considered.

Claims 33, 35-37 and 39-47 have been cancelled and claims 48-59 have been added by Amendment. Therefore, claims 29-32, 34, 38 and 48-59 are pending in the application.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 29-32, 38, 48-56 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. Appl. Pub. No. 2003/0123269 ("GILLINGHAM") in view of U.S. Pat. No. 6,697,276 ("PEREIRA") and Applicant's Admitted Prior Art ("AAPA").**

Regarding claim 29, GILLINGHAM discloses a content addressable memory (CAM) device comprising: rows of matchlines (within 102 in Fig. 1(a)) precharged to a voltage level corresponding to a miss condition (see for example Figs. 2(a) and 2(b) and paragraph [0039]), each of the rows of matchlines including a first matchline segment (one MLS in Figs. 2(a) and 2(b)) and a second matchline segment (another MLS in Figs. 2(a) and 2(b)); a first number of ternary cells connected in parallel to each of the first matchline segments (104 connected to said one MLS in Figs. 2(a) and 2(b); see also Fig. 1(c) and paragraphs [0025] and [0038]); a second

number of cells connected in parallel to each of the second matchline segments (104 connected to said another MLS in Figs. 2(a) and 2(b)), operable simultaneously with the ternary cells (since both are in the same search row in Figs. 2(a) and 2(b)); and, matchline sense amplifiers (including 210 in Figs. 2(a) and 2(b)) connected to the first matchline segments and the second matchline segments for detecting one of the miss condition and a match condition of the first matchline segments and the second matchline segments in response to search data (see Figs. 2(a) and 2(b)).

GILLINGHAM does not disclose that the second number of cells are binary cells smaller in size than the ternary cells.

However, GILLINGHAM discloses that the second number of cells are also ternary cells (i.e., all the cells in a search row are ternary cells; see for example paragraphs [0038] and [0025]).

PEREIRA discloses each row in a CAM device including a number of binary cells and a number of ternary cells according to application needs, as an obvious variation/alternative to all cells in each row being ternary cells (see for example column 34, lines 16-23).

AAPA discloses well known ternary cells (Figs. 3 and 4) and binary cells (Fig. 5) which are smaller in size than the ternary cells (compare Fig. 5 with Figs. 3 and 4).

Therefore, in view of PEREIRA, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to include a number of binary cells and a number of ternary cells in each row of GILLINGHAM's CAM device (as suggested in PEREIRA; for example, in the search row of Figs. 2(a) and 2(b) of GILLINGHAM), such that, as an optimum arrangement according an application need, a first number of ternary cells would

be connected in parallel to a first matchline segment and a second number of binary cells would be connected in parallel to a second matchline segment, as an obvious variation/alternative to the arrangement of GILLINGHAM (in which all cells in each search row are ternary cells in Figs. 2(a) and 2(b)), since PEREIRA indicates a desirability of such arrangement according to application needs, recognized by a person of ordinary skill in the art (implied in PEREIRA column 34, lines 16-23).

Further, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the ternary and binary cell configurations of AAPA in GILLINGHAM's CAM device as modified above, such that the binary cells would be smaller in size than the ternary cells, since such ternary and binary cell configurations, in which binary cells are smaller in size than ternary cells, were common and well known in the art (as exemplified in AAPA; see Figs. 3-5).

Regarding claim 30, the above combination discloses the content addressable memory device of claim 29, wherein the ternary cells include SRAM based ternary content addressable memory cells (see Figs. 3 and 4 of AAPA, as applied to the above combination; see also paragraph [0038] of GILLINGHAM, as applied to the above combination).

Regarding claim 31, the above combination discloses the content addressable memory device of claim 30, wherein the binary cells include SRAM based binary content addressable memory cells (see Fig. 5 of AAPA, as applied to the above combination).

Regarding claim 32, the above combination discloses the content addressable memory device of claim 29, wherein the ternary cells include DRAM based ternary content addressable

memory cells (see for example the second half of paragraph [0035] of GILLINGHAM, as applied to the above combination).

Regarding claim 38, the above combination discloses the content addressable memory device of claim 29, but does not disclose that the first number is selected to store at least a corresponding number of header bits.

However, AAPA further discloses use of ternary cells for header bits (see for example AAPA paragraph [0013]).

Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the first number to store at least a corresponding number of header bits in the above combination, for the purpose of effectively and efficiently accommodating variable bit length headers (see for example AAPA, near the end of paragraph [0012] and paragraph [0013]).

Regarding claims 48 and 52, the above combination discloses the content addressable memory device of claim 29, wherein one matchline sense amplifier connected to the first matchline segment is configured to disable one matchline sense amplifier connected to the second matchline segment in response to the miss condition of the first matchline segment (since, in the above combination, if a sense amplifier of a segment indicates a miss condition, the sense amplifiers in the subsequent segments indicate a miss condition regardless of miss/match conditions of the subsequent segments; see for example paragraphs [0041] and [0043], of

GILLINGHAM, as applied to the above combination; note that, for claim 52, the first and second matchline segment designations are reversed).

Regarding claims 49 and 53, the above combination discloses the content addressable memory device of claims 48 and 52, wherein the one matchline sense amplifier connected to the second matchline segment is configured to provide a match output if the first matchline segment and the second matchline segment have the match condition (see for example paragraphs [0042] and [0043] of GILLINGHAM, as applied to the above combination; note that, for claim 53, the first and second matchline segment designations are reversed).

Regarding claims 50 and 54, the above combination discloses the content addressable memory device of claim 29, wherein the second matchline segment is at the voltage level corresponding to the miss condition when the first matchline segment is at the voltage level corresponding to the miss condition (see for example Figs. 2(a) and 2(b) and paragraphs [0039], [0041] and [0043] of GILLINGHAM, as applied to the above combination; note that, for claim 54, the first and second matchline segment designations are reversed).

Regarding claims 51 and 55, the above combination discloses the content addressable memory device of claim 29, wherein the ternary cells connected to the first matchline segments are searched in a first search and compare cycle, and the binary cells connected to the second matchline segments are searched in a second search and compare cycle after the first search and compare cycle (i.e., sequentially; see for example paragraph [0044] of GILLINGHAM, as applied to the above combination; note that, for claim 55, the first and second matchline segment designations are reversed).

Regarding claim 56, the above combination discloses the content addressable memory device of claim 29, wherein the first matchline segment includes a third number of binary cells (as one of the optimum arrangements in the above combination for claim 29, based on application needs, in which at least two segments include both ternary and binary cells).

Regarding claim 58, the above combination discloses the content addressable memory device of claim 29, wherein the second matchline segment includes a third number of ternary cells (as one of the optimum arrangement in the above combination for claim 29, based on application needs, in which at least two segments include both ternary and binary cells).

**4. Claims 34, 57 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over GILLINGHAM in view of PEREIRA and AAPA as applied to claims 29, 56 and 58 above, and further in view of U.S. Pat. No. 6,108,227 ("VOELKEL").**

Regarding claim 34, the above combination discloses the content addressable memory device of claim 29, but does not disclose a third number of configurable ternary-binary content addressable memory cells connected in parallel to at least one of the first matchline segments and the second matchline segments.

VOELKEL discloses a configurable ternary-binary content addressable memory (CAM) cell (see for example Fig. 2), and an arrangement in which one or more columns of CAM cells can be switched between modes and such a switching capability can be performed on a column-by-column basis (see for example column 7, lines 5-15).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to include a third number of configurable ternary-binary content



addressable memory cells in each search row of the above combination (as in VOELKEL), such that the third number of configurable ternary-binary content addressable memory cells would be connected in parallel to at least one of the first matchline segments and the second matchline segments of the above combination, since, as an optimum arrangement, VOELKEL indicates a desirability of such arrangement, recognized by the person of ordinary skill in the art (implied in VOELKEL column 7, lines 5-15). In addition, use of the configurable cells provides a configuration flexibility. (see for example VOELKEL column 4, lines 21-33).

Regarding claims 57 and 59, the above combination discloses the content addressable memory device of claims 56 and 58, but does not disclose that the third number of binary cells (or ternary cells) are interleaved with the first number of ternary cells (or the second number of binary cells).

VOELKEL discloses a configurable ternary-binary content addressable memory (CAM) cell (see for example Fig. 2), and an arrangement in which one or more columns of CAM cells can be switched between modes and such a switching capability can be performed on a column-by-column basis (see for example column 7, lines 5-15).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to interleave the third number of binary cells with the first number of ternary cells in the above combination (for example, on a column-by-column basis, similar to the arrangement of VOELKEL), since, as an optimum arrangement, VOELKEL indicates a desirability of such arrangement, recognized by the person of ordinary skill in the art (implied in VOELKEL column 7, lines 5-15).

***Response to Arguments***

5. Applicant's arguments with respect to claim 29 have been considered but are moot in view of the new ground(s) of rejection, necessitated by the amendment (including the newly added claims). See the rejections above.

In response to the applicant's arguments that may be relevant to the new ground(s) of rejection, namely, regarding the PEREIRA reference (U.S. Pat. No. 6,697,276) as a secondary 103 reference on page 8 through the middle of page 9, see the above rejection for claim 29. It is also noted that claim 29 does not explicitly recite that the first matchline segment has only ternary cells connected thereto or that the second matchline segment has only binary cells connected thereto.

***Conclusion***

6. Applicant's amendment (including the newly added claims) necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. H. Hur whose telephone number is (571)272-1870. The examiner can normally be reached on M-F 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

jhh

/J. H. Hur/  
Primary Patent Examiner, Art Unit 2824  
09 July 2008